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Acupuncture Transmitted Infections

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1. Introduction

Among all modalities of alternative medicine, acupuncture is one of the most widely recognized and evidence-based. According to the central concept in Traditional Chinese Medicine, healthy functioning of the various organ systems depends on the body's circulating energy, known as *Qi*, moving in a harmonious and balanced way through a network of meridians (channels) and collaterals beneath the skin. In this network of meridians, the most important are the 12 main meridians and two of the eight extra meridians, *Du Mai* and *Ren Mai*. By inserting and manipulating fine needles into specific acupuncture points that are located in these channels of energy, it can promote the harmonious flow of *Qi* and stimulate the body's own healing response. By 2010, more than 350 specific acupuncture points have been defined in the World Health Organization classification system. Throughout the years, acupuncture has been widely used for chronic pain, digestive, allergic and menstrual problems as well as cessation of smoking and drug and alcohol rehabilitation.

Involving the insertion of needles up to several centimeters beneath the skin, the practice of acupuncture may pose risks to the recipients. Among all acupuncture associated complications, transmission of pathogenic microorganisms is one of the most important (Woo et al., 2010). With the increasing use of acupuncture globally, infections transmitted by acupuncture have become an emerging health problem. Needle reuse and/or inadequate skin disinfection has led to the transmission of infectious agents, including pyogenic bacteria, mycobacteria and blood borne viruses, from environment-to-patient and patient-to-patient. In this article, we reviewed all cases and outbreaks of acupuncture transmitted infections published in the English literature in the past four decades. The importance of setting up and implementation of proper infection control guidelines is also discussed.

2. Methods

For initial screening, "acupuncture" was used as the key word for Medline search in the English literature. The results were then manually screened for cases and outbreaks of infections transmitted by acupuncture. All infections transmitted by acupuncture were included.

3. Acupuncture transmitted pyogenic bacterial infections

All reported cases of pyogenic bacterial infections claimed to be associated with acupuncture treatment were sporadic ones, with the exception of one recently reported outbreak (Table). In the past four decades, a total of 52 isolated cases of pyogenic bacterial infections claimed to be associated with acupuncture treatment were reported in the English literature (Baltimore & Moloy, 1976; Izatt & Fairman, 1977; Jones & Cross, 1980; Pierik, 1982; Hadden & Swanson, 1982; Jefferys et al., 1983; R.J. Lee & McIlwain, 1985; Davis & Powell, 1985; Warwick-Brown & Richards, 1986; Gillbert, 1987; Scheel et al., 1992; Spleman et al., 1993; Garcia & Venkataramani, 1994; Kirschenbaum & Rizzo, 1997; C.Y. Chen et al., 1997; Matsumura et al., 1998; Yazawa et al., 1998; Lau et al., 1998; Ha et al., 1999; Origuchi et al., 2000; Ishibe et al., 2001; Nambiar & Ratnatunga, 2001; Laing et al., 2002; Uchino et al., 2002; S.Y. Lee & Chee, 2002; Shah et al., 2002; Woo et al., 2003; Y.P. Cho et al., 2003; Lin & Choong, 2003; Kettaneh et al., 2003; Daivajna et al., 2004; Saw et al., 2004; M.H. Chen & Huang, 2004; Studd & Steward, 2004; Vucicevic et al., 2005; Bang & Lim, 2006; Simmons, 2006; Seeley & Chambers, 2006; S. Lee et al., 2008; Tien et al., 2008; Richter et al., 2008; Morgan, 2008; Wu et al., 2009; Woo et al., 2009; Ogasawara et al., 2009; Nakajima et al., 2010; J.W. Kim & Y.S. Kim, 2010; Macuha et al., 2010; Koo et al., 2010; Chung et al., 2011) (Figure). Thirty-one (60%) of the cases were reported in the recent 10 years, which is probably related to the increase awareness of this disease entity and reporting of cases. The male to female ratio of the 52 patients was 23 to 29. The median age was 53 (range 12 - 84). Cases were reported globally from Asia, Europe, America and Australia. In most cases, pyogenic bacteria were transmitted from the patients' skin flora or the environment because of inadequate skin disinfection. Pain and/or stiffness were the reason for acupuncture in 37 (80%) patients, followed by smoking cessation (three patients), weight reduction (three patients), post-encephalitic vegetative state (two patients) and dyspepsia (one patient).

References	Origin	No. of patients involved	Microbes	Diagnosis	Source of outbreak	Mode of transmission	Outcome
<i>Bacterial infections</i>							
Murray et al., 2008	Australia	8	Methicillin resistant <i>Staphylococcus aureus</i>	Septic arthritis and bursitis, pyomyositis, bacteremia	Acupuncturist is a nasal carrier of the same methicillin resistant <i>Staphylococcus aureus</i>	Poor infection control practices and sterile techniques e.g. touch sterile, gloved hand with ungloved hand	All survived
<i>Mycobacterial infections</i>							
Ryu et al. 2005; Song et al., 2006	Korea	40	<i>Mycobacterium abscessus</i>	Cutaneous infections	Not known	Not known	Majority with residual skin lesions
Tang et al., 2006	Canada	32	<i>Mycobacterium abscessus</i>	Cutaneous infections	Not known	Not known	All developed residual scarring or hyperpigmentation

References	Origin	No. of patients involved	Microbes	Diagnosis	Source of outbreak	Mode of transmission	Outcome
Kim et al., 2010	Korea	3	<i>Mycobacterium tuberculosis</i>	Cutaneous infections	All patients received acupuncture from an illegal acupuncturist	Not known	All skin lesions resolved, one with residual mild hyperpigmentation
Koh et al., 2010	Korea	109	<i>Mycobacterium abscessus</i>	Cutaneous infections	Contaminated disinfectant (diluted glutaraldehyde)	Diluted glutaraldehyde prepared few months prior use contaminated physical therapy devices which were applied to patients prior to acupuncture	Unknown
<i>Viral infections</i>							
Boxall, 1978	UK	36	Hepatitis B virus	Clinical hepatitis, details not mentioned	Not known	Repetitive use of unsterilized needles	Not mentioned
Stryker et al., 1986	USA	6	Hepatitis B virus	Icteric hepatitis	A patient with hepatitis B infection	Improperly sterilized needles	All survived
Slater et al., 1988	Israel	5	Hepatitis B virus	Clinical hepatitis, details not mentioned	A patient towards the end of her incubation period	Improperly sterilized or unsterilized needles	Not mentioned
Kent et al., 1988	USA	35	Hepatitis B virus	Icteric hepatitis (n = 11), asymptomatic (n = 24)	A patient with hepatitis B infection	Repetitive use of unsterilized needles or transfer of infectious material to sterile needles through the hands of acupuncturist	All survived and hepatitis B virus surface antigen negative
Walsh et al. 1999	UK	5	Hepatitis B virus	Icteric hepatitis	Hepatitis B virus surface antigen and e antigen positive acupuncturist	Not known	Not mentioned

Table. Outbreaks of pyogenic bacterial, mycobacterial and viral infections associated with acupuncture

Clinical diagnosis of pyogenic bacterial infections associated with acupuncture is usually not difficult because of the relatively short incubation period, in terms of days. For localized infections, meridian- and acupuncture point-specific lesions were characteristics, as acupuncture involves insertion of needles into specific acupuncture points at specific locations along the various meridians. Among the 52 sporadic cases, 37 (71%) patients had musculoskeletal and/or skin infections usually in the form of abscesses or septic arthritis, corresponding to the site of insertion of the acupuncture needles. One case involved use of pharmacopuncture (injection of herbal ingredient which was not produced by sterile standard processes through a thin tube for the purpose of combining effect of acupuncture and the herb) and resulted in multiple abscesses in the psoas region (Koo et al., 2010). In spite of the relatively short incubation period for pyogenic infection associated with acupuncture, the implantation of permanent needles could result in infection occurring years after acupuncture. One case with permanent needles inserted 13 years ago developed prosthetic joint infection two months after total knee arthroplasty, despite sterile synovial fluid and tissue obtained pre-operatively and intra-operatively during primary arthroplasty (Nakajima et al., 2010). It is possible that subclinical infection resulted from the permanent needles in the joint gave rise to prosthetic joint infection after surgical manipulation. Eight (15%) patients had infective endocarditis and/or mycotic and/or infected atrial myxoma. In most of these cases, the infections were attributed to acupuncture because of a temporal relationship between acupuncture and the infections, of which the incubation period ranged from 2 to 18 days except for one case, and absence of other identified events resulting in transient bacteremia for cardiovascular infections. For the exceptional case, the aortic mycotic aneurysm developed six months after acupuncture, which made the causal relationship less convincing (Origuchi et al., 2000). For the remaining cases, one patient each had meningitis with lumbar epidural hematoma, endophthalmitis complicating cervical spondylitis, retroperitoneal abscess, intraabdominal abscess, empyema thoracis and bacteremia without other primary focus of infection.

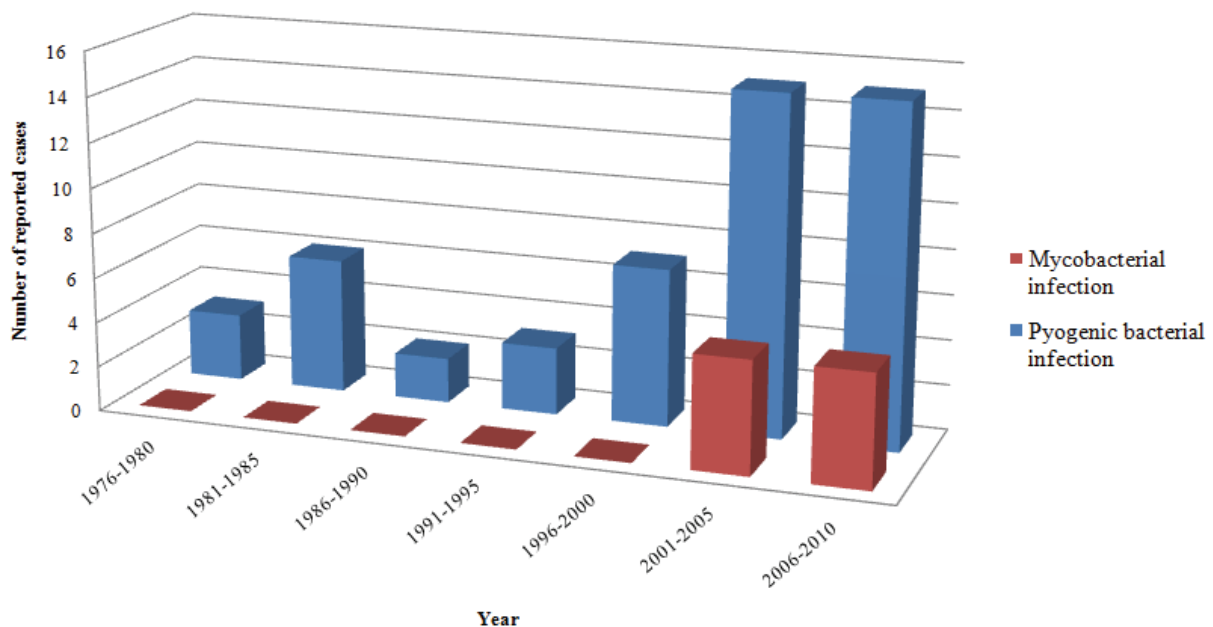


Fig. Sporadic cases of pyogenic bacterial and mycobacterial infections transmitted by acupuncture reported in the English literature

As in other musculoskeletal and/or skin infections, *Staphylococcus aureus* is the most common bacterium causing pyogenic infections associated with acupuncture. Among the 41 (79%) patients with positive cultures in the sporadic cases, 37 (90%) and five (10%) had monomicrobial and polymicrobial infections respectively. The most common bacterium recovered was *Staphylococcus aureus* [22 (54%) cases], followed by *Pseudomonas aeruginosa* [five (12%) cases], *Escherichia coli* [three (7%) cases], *Enterococcus faecalis* [two (5%) cases], *Bacteroides fragilis* [two (5%) cases] and one case each of *Staphylococcus epidermidis*, group A streptococcus, group B streptococcus, *Streptococcus anginosus*, *Streptococcus bovis*, *Listeria monocytogenes*, *Clostridium botulinum* + *Clostridium histolyticum* + *Clostridium subterminale*, *Bifidobacterium longum*, *Propionibacterium acnes* and *Klebsiella pneumoniae*. For the patient with infected atrial myxoma associated with *Streptococcus bovis*, the authors attributed acupuncture to be the cause of infection just because the patient had received repeated courses of acupuncture during a two-month period before the onset of infection, without mentioning the possibility of the gastrointestinal tract as a source of the bacterium (Uchino et al., 2002). Since *Streptococcus bovis* is not part of the skin flora, this case of *Streptococcus bovis* infected atrial myxoma associated with acupuncture was not convincing. Nineteen (37%) of the patients had positive blood cultures. All of them had monomicrobial bacteremia, with *Staphylococcus aureus* being the most common bacterium recovered [11 (58%) cases], followed by one case each of group A streptococcus, group B streptococcus, *Streptococcus bovis*, *Bifidobacterium longum*, *Propionibacterium acnes*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Klebsiella pneumoniae*.

Pyogenic bacterial infections associated with acupuncture had resulted in major morbidity and mortality with long duration of antibiotics and hospital stay. Standard antibiotics with or without surgical intervention were the mainstay of treatment for pyogenic bacterial infections associated with acupuncture. Among the 35 (67%) patients in the sporadic cases with duration of antibiotics reported, four (11%), six (17%) and 18 (51%) received 2 to <4 weeks, 4 to <6 weeks and ≥ 6 weeks of antibiotics respectively. Thirty-five (67%) patients required drainage and/or other surgical treatment. Overall, three (6%) patients died. Although most infections started with localized infections and almost all patients were immunocompetent, a significant proportion had resulted in serious consequences, such as joint destruction, paraplegia, necrotizing fasciitis and multiorgan failure.

In addition to the 52 isolated cases, one outbreak of methicillin resistant *Staphylococcus aureus* infections associated with acupuncture, which represented the first reported outbreak of pyogenic infections associated with acupuncture, was described recently from Australia (Table) (Murray et al., 2008). Five of the patients had septic arthritis and bursitis and the other three had pyomyositis. Three patients had bacteremia. The source of the outbreak was traced to an acupuncturist, who carried the same methicillin resistant *Staphylococcus aureus* as the patients in his nasal cavity, demonstrated by pulsed field gel electrophoresis and ribotyping. All patients responded to prolonged antibiotics treatment (median 72 days, range 21 - 127 days) and none of the patients died.

4. Acupuncture transmitted mycobacterial infections

In contrast to pyogenic bacterial infections, only eleven sporadic cases of acupuncture-associated mycobacteriosis have been reported in the English literature (Woo et al., 2001, 2002; Ara et al., 2003; H.J. Cho et al., 2010; W.J. Lee et al., 2010; Guevara-Patiño et al., 2010; Castro-Silva et al., 2011) (Figure). On the other hand, four outbreaks have been described

(Table) (Ryu et al., 2005; Song et al., 2006; Tang et al., 2006; J.K. Kim et al., 2010; Koh et al., 2010). While one outbreak involved 32 patients from Canada, the other three were all reported from Korea including the largest outbreak involving up to 109 patients (Koh et al., 2010). One of them, involving 40 patients, was reported by two groups from Korea (Ryu et al., 2005; Song et al., 2006), whereas the other one involved only three patients (J.K. Kim et al., 2010). Although only rarely documented by positive culture of environmental samples, mycobacteria were believed to be transmitted from the environment to the patients via contaminated equipments used for acupuncture treatment in most cases, such as cotton wool swabs, towels, hot pack covers and boiling tank. In the largest outbreak reported from Korea (Koh et al., 2010), *Mycobacterium abscessus* was isolated from the contaminated disinfectant (diluted glutaraldehyde) which was believed to be the source of outbreak. During the disinfection process, the electrodes for interferential current and low-frequency therapies may have been contaminated and mycobacteria were transmitted to the skin of the patients during physical therapy. The subsequent needle penetration then introduced the infection.

All mycobacterial infections associated with acupuncture were characterized by localized meridian- and acupuncture point-specific lesions without dissemination. In the Canadian outbreak involving 32 patients, all lesions developed over previous acupuncture sites, and about one third of the patients had 10 or more lesions (Tang et al., 2006). Usually the lesions first appeared as erythematous papules and nodules that subsequently developed into large pain pustules, abscesses and ulcerative lesions after several weeks to months (Woo et al., 2001, 2002; Ara et al., 2003; H.J. Cho et al., 2010; W.J. Lee et al., 2010; Guevara-Patiño, et al., 2010; Castro-Silva et al., 2011; Ryu et al., 2005; Song et al., 2006; Tang et al., 2006). Among all the reported cases, only around 10% of them had systemic symptoms (Koh et al., 2010).

In contrast to pyogenic bacterial infections, acupuncture-associated mycobacteriosis were often associated with delay in diagnosis. Acupuncture-associated mycobacteriosis were associated with a relatively long incubation period. In the Korean and Canadian outbreaks that involved a total of 184 patients, the median incubation periods ranged from one week to 4.75 weeks (Ryu et al., 2005; Song et al., 2006; Tang et al., 2006; J.K. Kim et al., 2010; Koh et al., 2010). This is in line with the long incubation periods of one to three months in infections due to rapidly growing mycobacteria, as reported in cases of *Mycobacterium chelonae* and/or *Mycobacterium fortuitum* infections of breast implants, midpalmar space, epidural space, and skin (Safranek et al., 1987; O'Brien & Rawluk, 1999; Clegg et al., 1983; Camargo et al., 1996; Crick & Vandeveld, 1986). The long incubation period rendered patients unable to associate the event of acupuncture with the clinical illness. Moreover, patients tended to delay in seeking medical advice because of the indolent and relatively mild symptoms. In the Canadian outbreak, some patients continued to receive acupuncture treatments while they had lesions on their bodies (Tang et al., 2006). Furthermore, failure of the attending clinicians to recognize acupuncture-associated mycobacteriosis as a cause of indolent skin and soft tissue infection due to a lack of awareness of such a disease entity, as well as the assumption of "adequate" skin disinfection with alcohol and the use of disposable acupuncture needles, have also resulted in delay in diagnosis. In the four sporadic cases of mycobacterial infections associated with acupuncture reported earlier in the year 2001 and 2002, the diagnosis was made during subsequent infectious disease consultations, when the patients recalled the history of acupuncture only on direct questioning of whether the involved site has been penetrated by sharp objects in recent months (Woo et al., 2001, 2002).

In the two outbreaks reported in the mid-2000s, the median time to correct diagnosis was about three to four months (Ryu et al., 2005; Song et al., 2006; Tang et al., 2006). Of note is that the first case of acupuncture transmitted mycobacterial infection was reported in 2001 (Woo et al., 2001), 25 years after the first case of acupuncture transmitted pyogenic bacterial infection was described!

The reported cases of acupuncture mycobacteriosis were caused by both rapidly and slow growing mycobacteria, as recovered in biopsy specimens of the lesions, which responded to the anti-mycobacterial treatment for the corresponding mycobacteria with or without surgical excision. In the three large outbreaks, *Mycobacterium abscessus* was the causative microbe isolated (Ryu et al., 2005; Song et al., 2006; Tang et al., 2006; Koh et al., 2010), whereas in the sporadic cases, a wider variety of mycobacteria were recovered, including *Mycobacterium chelonae*, *Mycobacterium nonchromogenicum*, *Mycobacterium abscessus*, *Mycobacterium avium* complex and *Mycobacterium haemophilum* (Woo et al., 2001, 2002; Ara et al., 2003; H.J. Cho et al., 2010; W.J. Lee et al., 2010; Guevara-Patiño et al., 2010; Castro-Silva et al., 2011). In addition to the conventional laboratory methods, 16S ribosomal RNA gene sequencing and/or sequencing other housekeeping genes were important for identification of the *Mycobacterium* species responsible for causing the infections (Woo et al., 2008). Despite generally not environmental in origin, *Mycobacterium tuberculosis* was identified as the causative microbe in one outbreak involving three patients who developed cutaneous infection corresponding to the acupunctural sites (Kim et al., 2010). The diagnosis was confirmed by polymerase chain reaction in two patients with one of them also being cultured positive. Histologically, all cases were characterized by typical features of mycobacterial infections, such as granulomatous inflammation, caseous necrosis and epithelioid and multinucleated giant cells with or without the presence of acid fast bacilli (Woo et al., 2001, 2002; Ara et al., 2003; H.J. Cho et al., 2010). For medical treatment against the rapid growers, we recommended a combination of imipenem, clarithromycin/azithromycin and amikacin in the first few weeks for a rapid reduction of mycobacterial load and reducing the chance of emergence of resistance, followed by clarithromycin/azithromycin maintenance for a few more months. Surgical excision would be necessary for large lesions. Although most patients responded, a lot of the patients had residual scarring and/or hyperpigmentation.

5. Acupuncture transmitted viral infections

Theoretically, all blood borne viruses can be potentially transmitted by acupuncture. In the literature, the best documented cases were hepatitis B virus, and to a less extent, hepatitis C virus. Most cases of acupuncture associated blood borne virus infections were due to transmission of the virus from one acupuncture patient who carried the virus to another. Occasionally, the infection was transmitted from the acupuncturist who carried the virus to the patient. In all these cases, reusable acupuncture needles that were inadequately sterilized were used. As a result of the increasing use of disposable needles, the incidence of blood borne viruses transmitted by acupuncture will be expected to decrease.

5.1 Hepatitis B virus

Among the blood borne viruses transmitted by acupuncture, hepatitis B virus is the best documented one, and is also the one involved in the largest number of outbreaks globally,

which have provided invaluable information on the epidemiology of acupuncture transmitted hepatitis B virus infections. A total of five acupuncture transmitted hepatitis B virus outbreaks have been reported in the English literature, involving more than 80 patients (Table) (Boxall, 1978; Stryker et al., 1986; Slater et al., 1988; Kent et al., 1988; Walsh et al., 1999). In most of the outbreaks, the sources were patients with hepatitis B virus infections. Hepatitis B virus was transmitted from one patient to another through improperly sterilized or unsterilized reusable acupuncture needles. In one of the outbreaks, a hepatitis B virus surface antigen and hepatitis B virus e antigen positive acupuncturist was believed to be the source, although the acupuncturist denied testing the sharpness of needles on his own skin before inserting them into patients.

5.2 Hepatitis C virus

Unlike hepatitis B virus, hepatitis C virus infections are almost always asymptomatic in the acute phase. Therefore, it is difficult to ascertain that acupuncture as the definite route of transmission of the virus by tracing the source and performing molecular typing studies. Moreover, outbreaks, if occurred, would be difficult to recognize, and therefore none have been reported in the literature. On the other hand, most evidence for the association of hepatitis C virus infection with acupuncture came from epidemiological and case control studies. In more than 10 of these studies carried out in different parts of the world, acupuncture was found to be an independent risk factor for hepatitis C virus infections (Karmochkine et al., 2006; Kweon et al., 2006; Karaca et al., 2006; Lasher et al., 2005; Ernst & Sherman, 2003; Shin et al., 2000, 2002; Sanchez et al., 2000; Sun et al., 1999; Balasekaran et al., 1999; Kayaba et al., 1998; Sulaiman et al., 1995; Kiyosawa et al., 1994; Cavalheiro Nde et al., 2009).

5.3 Human immunodeficiency virus

Unlike hepatitis B virus transmitted by acupuncture with concrete evidence of outbreaks and molecular typing that confirmed the same hepatitis B virus strain from the source and recipients and hepatitis C virus transmitted by acupuncture with evidence from case-control studies, the evidence of human immunodeficiency virus transmitted by acupuncture was just circumstantial. In all the five cases of “acupuncture associated human immunodeficiency virus infections” reported in the English literature, the human immunodeficiency virus positive patients had no other risk factors for the human immunodeficiency virus infection, such as transfusion, sexual intercourse, haemophilia, intravenous drug use or other injections, operation, and tattooing, other than acupuncture (Chamberland et al., 1989; Vittecoq et al., 1989; Castro et al., 1988; Wiwanitkit, 2003).

6. Infection control in acupuncture

To prevent acupuncture transmitted infections, strict adherence to proper infection control guidelines is mandatory. Although guidelines for carrying out the proper procedures of acupuncture are available (Chinese Medicine Registration Board of Victoria), implementation of such guidelines, even in developed countries, is far from ideal. To prevent transmission of microbes from acupuncturists to patients, acupuncturists should be vaccinated against hepatitis B virus and they should not test the sharpness of needles on their own skin before inserting them into patients. To prevent patient-to-patient

transmission of blood borne viruses, the use of disposable acupuncture needles should be strictly followed. Needle reuse should be discouraged because almost all hepatitis B virus outbreaks, and probably other undocumented cases of patient-to-patient transmission of blood borne viruses, were transmitted by improperly sterilized reuse needles. In a recent survey, it was found that in village clinics in mainland China, reusable acupuncture needles were disinfected with alcohol rather than being sterilized, due to concerns that sterilization might blunt the needles (Reynolds & McKee, 2008). Furthermore, proper disinfection of work area (Chinese Medicine Registration Board of Victoria) and physical device, as well as good personal hygiene and proper skin disinfection before needle insertion is the cornerstone to prevent environment-to-patient transmission of pyogenic and mycobacterial infections. Medicinal herbs or agents used for pharmacopuncture treatment must be produced and controlled by sterilization or standardization. Among the infectious agents transmitted by acupuncture, mycobacteria survive the best in disinfectants. As mycobacteria are resistant to chlorhexidine, we recommend that the acupuncturist should wash his/her hands with alcoholic chlorhexidine or povidone iodine before acupuncture treatment. Surgical masks should be worn during needle insertion. The patient's skin should be disinfected by swabbing with 75% alcohol that is properly reconstituted without top up. While there was inadequate evidence to support a "minimum disinfection time", the Australian Acupuncture Association Infection Control Guidelines for Acupuncture recommended that the skin disinfection time should be at least 30 seconds or the site of insertion should be "just dry" before the patient's skin is pierced (Australian Acupuncture Association Limited, 1997). However, our results showed that mycobacteria can survive in alcohol for up to 45 seconds (Woo et al., 2002). Therefore, skin disinfection time of at least one minute is recommended before insertion of acupuncture needle. To ensure adequate time for disinfection, the acupuncturist can disinfect a group of acupuncture sites before inserting the needles in a sequential order.

7. Conclusion

In the 1970s and 1980s, the majority of the infections associated with acupuncture were sporadic cases of pyogenic bacterial infections, mainly due to *Staphylococcus aureus*, as well as outbreaks of hepatitis B virus infections. As a result of the increasing use of disposable needles in developed countries, the reported incidence of blood borne viruses transmitted by acupuncture has decreased in 1990s, while acupuncture-transmitted pyogenic bacterial infections persisted. In 2000s, a novel clinical syndrome, acupuncture mycobacteriosis, mainly caused by rapidly growing mycobacteria, has emerged. Due to the relatively hardy nature of mycobacteria, the long incubation period and difficulty in making diagnosis, mycobacteria has caused acupuncture associated outbreaks involving large numbers of patients. The case reports and outbreaks on acupuncture-transmitted infections we summarized in this article are just the tip of the iceberg of a global emerging problem. Although China is presumably the country where acupuncture is most widely used and the hygienic conditions in mainland China are far from ideal with the use of reusable acupuncture needles still in practice, none of the reports of sporadic cases or outbreaks were from mainland China. In 2009, there were first reports of methicillin resistant *Staphylococcus aureus* transmitted by acupuncture. We predict that the emergence of community-associated methicillin resistant *Staphylococcus aureus* infections would further aggravate the problem. To prevent acupuncture-transmitted infections, more resources should be spent on

implementation of proper infection control guidelines, as the financial burden due to prolonged hospitalization and antimicrobial and surgical treatment, the long-term sequel and mortality would be far beyond that used for implementation of guidelines.

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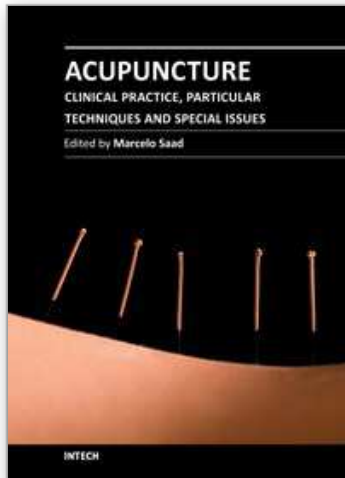
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Acupuncture is growing in popularity world-wide. Acupuncture and related techniques are useful tools for treating a spectrum of diseases. However, there are still many areas of controversy connected to it due to the fact that mechanisms of action of acupuncture are not entirely clear. Another debilitating element is the absence of a convincing model of sham acupuncture for a control group in clinical trials. Therefore, there are still inappropriate prejudice and unfamiliarity regarding acupuncture. I hope this book can contribute to guide the advance of this ancient medical art. The reader will here find texts wrote by authors from different parts of the world. The chapters cover strategic areas to collaborate with the consolidation of the knowledge in acupuncture. The main objective is to share elements to make acupuncture more and better offered at health systems worldwide.

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